Educational technology: evidence of impacts on teaching and learning. Findings and recommendations from the DFID Topic Guide on Educational Technology, 2014.

Conference or Workshop Item

Educational technology: evidence of impacts on teaching and learning.

Findings and recommendations from the
DFID Topic Guide on Educational Technology, 2014

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introduction

what is educational technology?

‘‘the use of digital or electronic technologies and materials to support teaching and learning”

(Emerging DFID policy language, 2014)

“Technology of itself doesn’t enhance learning!

It depends how the technology is designed and implemented; how teachers are supported to use it; how outcomes are measured; what communities are in place to support it”.

(TEL.ac.uk , 2014).

Evidence…

"The collective weaknesses of educational technology research has created a challenging situation for **educational leaders and policy makers who must use flawed or limited research evidence to make policy and funding decisions**.

Even today, **little empirical research exists to support many of the most cited claims** on the effects of educational technology…

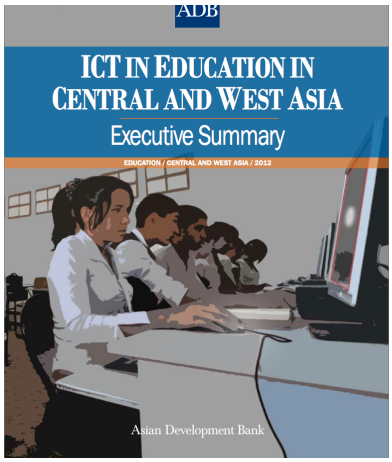
…Too often… **studies focus on technology access instead of measuring the myriad ways that technology is being used**. Such research assumes that teachers’ and students’ access to technology is an adequate proxy for the use of technology."

Bebell, D., O'Dwyer, L., Russell, M., and Hoffmann, T. (2010).
Concerns, considerations, and new ideas for data collection and research in educational technology studies.
Journal of Research in Technology Education, 43(1):23–52.

…in low to lower-middle income countries?

Critical overview of the effectiveness of ICT policies and strategies in Central and West Asia by ADB finds:

'*...an emphasis in most systems on hardware provision - and the unfortunate but widespread assumption that provision of hardware by itself is the solution to a range of educational problems.*' (ADB 2012, p.iv).



…in low to lower-middle income countries?

- meta-analysis of randomised controlled studies on a range of primary school educational interventions in 'lower to upper-middle-income' countries: **educational technology programmes had the greatest mean effect size, at 0.15** (McKewan 2013)
- But, **effect size of 0.4 is suggested benchmark** for educational significance (Hattie, 2009).

McKewan, P. (2013). Improving learning in primary schools of developing countries: A meta-analysis of randomized experiments. William and Flora Hewlett Foundation, Wellesley, MA.

Hattie, J. (2009). Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. Routledge, Abingdon, UK, 1 edition.

Purpose of Educational Technology Topic Guide:

- contribute to the evidence linking educational technology programmes to educational outcomes
- Appraise the evidence that the use of EdTech, by teachers or students impacts teaching and learning practices, or learning outcomes
- Make practical, evidence-based recommendations, for Education Advisors

Appraisal Process

- Review of over 80 studies (45 research documents; 20 literature reviews; 18 grey literature reports) of Educational Technology use in schools, for teaching and learning, in low to lower-middle income countries
- appraisal against DFID criteria (e.g. transparency, rigour, validity) to identify key findings and rate the quality of the evidence.
- written analysis addressing research questions, focussing on evidence of impact on classroom practices and learning outcomes.

Findings:
Technology use by teachers

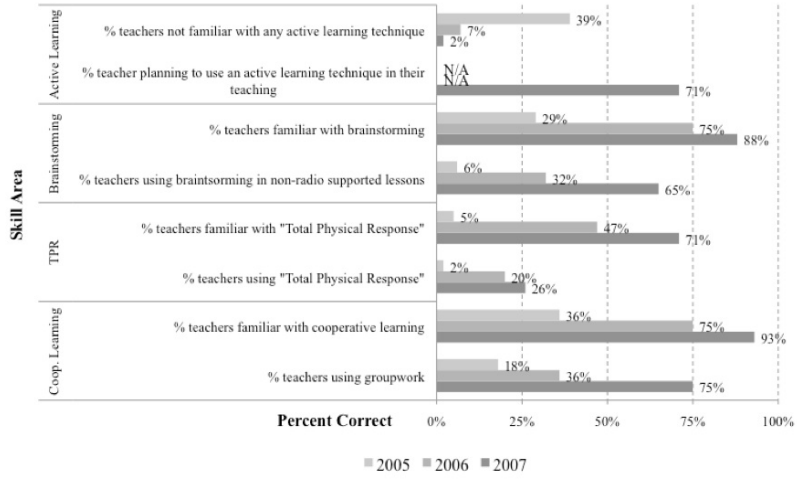
Interactive Radio Instruction (IRI)

- Many studies evidencing positive impacts on learning outcomes.
- Average effect sizes +0.5 (World Bank, 2005)
- Wide variation in effect size (-0.18 to +2.19) attributed to quality of implementation, monitoring, and local support capacity. (Ho & Thrukal, 2009)
- Largest effects only seen for youngest learners (grade 1).

IRI & Classroom practice?

- Sous le Fromager, Guinea: IRI for students, plus radio and f-2-f support for teacher development. Qualitative observations (Burns, 2006):
  - decreased teacher violence towards students
  - increased time allowed for students to develop understanding
- IRI, Mali: IRI for students, plus radio-based INSET. Systematic observations (Ho & Thrukal, 2009):
  - increased teacher awareness of promoted classroom techniques
  - increased teacher use of promoted classroom techniques

IRI + radio INSET, Mali



Ho & Thukral 2009, p.32

Mobiles for classroom audio and teacher development video

EIA, Bangladesh: several studies on use of mobiles to support teacher development and classroom practice, with follow-on support and monitoring in schools and districts, for English Language Teachers.

- Large scale systematic observations of classroom practice (EIA 2011, 2012, 2014) show increased use of target language; increased student talk-time; increased use of pair and group work.
- Large scale assessments (EIA 2012, 2014) of student learning outcomes, show improved competence in target language (EIA, 2014):
  - 35% more primary students achieve grade 1 or above
  - 20% more secondary students achieving grade 2 or above

mobiles for classroom video

BridgeIT, India and Tanzania: several studies on use of mobiles to provide video lessons, with teacher activity guide, and follow-on support & monitoring in schools.

- Systematic observations of classroom practices: India: 31% increase in lessons rated 'high quality' (Wennerstan et al, 2012)
- Learning outcomes:
  - Tanzania: average gains of 10%-20% over controls, in maths and science (Enge, 2011)
  - India: average gains of 10% in science; no gains for English (Wennerstan et al, 2012)

teacher or tutor mobile devices for professional development

PRIMR, Kenya: 3 treatment groups: teacher educator tablets, teacher tablets, student eReaders, for improving early literacy (Gathenya, 2014).

- Teacher or Teacher educator tablets, for professional development, produced equal gains in learning outcomes, to student eReaders.
- Costs for teacher or teacher educator tablets, were significantly lower than for student eReaders.
- Cost-effectiveness of teacher or teacher educator tablets were almost an order of magnitude higher, than for student eReaders.

Findings: Technology use by students

Computers: no benefit to teaching or learning from increased access per se

- Enlaces, Chile (Hinostroza et al, 2011): improved access to ICT in 98% of 8,939 schools, but: '*...ICT is not frequently used*'. [national survey]
- OLPC, Peru (Cristia et al, 2012): despite increasing student-computer ratio ten-fold, '*the program did not seem to have affected the quality of instruction in class... laptop use was directed to activities that might have little effect on educational outcomes.*' [RCT]
- NEPAD, Rwanda (Rubagiza et al, 2011): '*teachers are not in general using the HealthPoint software…'* [qual. methods]
- Myanmar (UNESCO, 2013): 33,497 schools provided with ICT facilities, but '…*use of ICT for teaching and learning was considered to be very low.'*
- EdQual, Ghana & Tanzania (Edqual, 2011): '*computers are often not used for teaching and learning purposes…*

'Provision of ICT is only a first step. For ICTs to become a tool for improving teaching and learning… they need to be supplemented by teacher professional development'. (Edqual, 2011)

Computers: students benefit from purposeful use

Few examples, all in context of **teacher development** programmes promoting **project / enquiry** based learning, supported with **curriculum resources**:

- Greater extent of independent / collaborative student work; less dependance upon teacher / textbook (Leach et al, 2005; Light, 2008; Were et al, 2009)
- Students perceive group work to produce better / deeper learning than individual work with computers. Students identify optimum group size between 3 or 4 (Haßler,et al., 2011) and 5 (Leach 2008).

Computers: some students benefit from CAL in mathematics.

- CAL mathematics as a **replacement** for regular teachers of no benefit (Banerjee, 2007) or **may lower learning outcomes** (Linden, 2008),
- Some evidence of improved learning outcomes from CAL as **supplement** for
  - underprivileged students (Banerjee, 2007)
  - under-performing students (Lai et al, 2011)

eReaders / tablets for early literacy

Several examples all in context of **teacher development** programmes promoting **phonics-based literacy**, supported with **student reading materials:**

- TeacherMate, Rwanda: increase of 22% above controls, in standardised verbal skills, for p2 & p3 students (Murz, 2011)
- PRIMR, Rwanda: increases of 14% (Kiswahili) and 23% (English) above controls, in Oral Reading Fluency (USAID, 2013).
- WorldReader, Ghana: Improvements in Early Grade Reading Assessment (EGRA) scores of 7% above baseline. (Worldreader 2012). Treatment students learn mother tongue (Twi) twice as fast as control students (Worldreader, 2013).

Findings: summary

- Effective EdTech programmes are characterised by:
  - clear curriculum & pedagogic purpose
  - relevant curriculum materials for students
  - programmes of teacher development, focused on curriculum & pedagogy, not technology
  - monitoring & evaluation focussed upon 'outcomes' not 'outputs'.

Findings: summary

- Amongst such programmes, there is evidence of improvements in practice and outcome, particularly from use of:
  - Interactive Radio Instruction, especially for early primary education
  - student tablets and eReaders for early literacy programmes
  - Classroom audio / video resources on teachers mobile phones
  - Digital resources and tools to support independent / collaborative project based learning.
  - Remedial CAL programmes in Mathematics.

Findings: summary

More needs to be known

- about how to support and enable teachers to develop appropriate, relevant practices with educational technology
- about how such practices are enacted in schools, and what factors contribute to or mitigate against successful outcomes.

Recommendations

1. Educational Technology programmes should focus on enabling educational change (not delivering technology); provide adequate support to teachers and schools; capture changes in teaching practice and learning outcome.

2. Advisors should encourage proposals that further develop practices that are already shown to be successful, or which address gaps in evidence and understanding.

3. Advisors should discourage proposals with an emphasis on technology over education, weak programmatic support, or poor evaluation.

4. Value for Money metrics, and cost effectiveness analysis should be carried out; approaches may need further development.